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A revision of *Bambusa* (*Gramineae : Bambusoideae*) in the Malay Peninsula, with two new species

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Summary. A revision of *Bambusa* in the Malay Peninsula shows that there are nine species there, of which only the newly described *B. farinacea* is undisputedly native. The remaining eight are known only in cultivation, including another newly described species, *B. laxa*. *B. klossii* Ridl. is a synonym of *Dendrocalamus hirtellus* Ridl. *B. magica* Ridl., *B. montana* (Ridl.) Holtt. (synonym *B. pauciflora* Ridl.), *B. ridleyi* Gamble, and *B. wrayi* Stapf are also excluded from *Bambusa* because they represent four other distinct genera.

The revision by Holttum (1958) recognised four species of *Bambusa* in the Malay Peninsula. Among characters which he used to circumscribe this genus were the presence of a terminal vestigial flower and long rachilla internodes which disarticulated below the lemmae in the spikelet, and the presence of three lodicules and a keeled palea with an acuminate or truncate apex in each floret. The nature of the rachilla internodes was of particular importance in distinguishing *Bambusa* from the allied *Gigantochloa* and *Dendrocalamus*, where rachilla internodes are not elongated and do not disarticulate below the lemmae. (*Schizostachyum* has similar rachilla internodes and three lodicules, but is distinguished by a reduced number of flowers, a glabrous ovary and a rigid hollow style with a central strand of tissue in it.)

In his account, Holttum (1958) had reservations about the inclusion of an alliance of Malayan montane species, all characterised by a reduced number of florets in the spikelet, within *Bambusa*. These were: *B. pauciflora* Ridl., *B. montana* (Ridl.) Holtt., *B. klossii* Ridl., and *B. wrayi* Stapf. In the present study, *B. pauciflora* is identified as synonymous with *B. montana*, and *B. klossii* as interpreted by Holttum is found to have two elements: one (corresponding with the type) is *Dendrocalamus hirtellus* Ridl. and the other is *B. montana* (see end of listing under *Bambusa*). In effect, Holttum's reservations about whether certain species of *Bambusa* had been identified with the right genus applied only to *B. montana* and *B. wrayi*. These have now been shown to belong to two distinct genera, *Maclurochloa* and *Kinabaluchloa*, respectively (Wong 1993).

Two other species which (as typical of *Bambusa*) have 3-5 fertile florets separated by rather long rachilla internodes in the spikelet *viz.*, *B. ridleyi* Gamble and *B. magica* Ridl., also have characters that are incongruent with those of the typical and better known species of *Bambusa* (including *B. blumeana, B. vulgaris, B. multiplex* and the generic type *B. bambos*, a spiny bamboo often mistakenly called *B. arundinacea*). These include a wrinkled thickened culm-sheath base much like those in *Dinochloa* and a bifid palea in the flower (for *B. ridleyi*), and a lack of any dominant branches at each node, together with branches that typically do not rebranch (in the case of *B. magica*). These two species also belong to distinct genera, named *Soejatmia* and *Holttumochloa*, respectively (Wong 1993).

Systematic Enumeration

BAMBUSA Schreber, Gen. Plant. ed. 8, 1 (1789) 236. Nom. cons.

Type species: *Bambusa bambos* (L.) Voss

Rhizomes sympodial. Culm sheaths with blades typically erect (at least initially), auricles typically lobe-like and bristly on the margin. Buds at each culm node solitary; the primary-branch bud prophyll with fused margins and hairy keels. Mid-culm branch complement with a dominant primary branch and 1-several secondary branches and usually several smaller branchlets from its base. Leaf blades typically with an obtuse base. Leafy branches becoming much-branched as they develop inflorescences; inflorescences iterauctant. Pseudospikelets typically longer than 1 cm, often several cm long, consisting of 0-several small empty bracts, 1-several bracts subtending prophyllate buds, 0-several transitional (empty) glumes (shorter than the lowest lemma), 3-10 perfect flowers and 1-3 terminal vestigial flowers; rachilla internodes between flowers elongated, disarticulating below the lemmae; palea 2-keeled, apex rounded, truncate or slightly cleft but not distinctly bifid; lodicules 3, margins hairy; stamens 6, filaments free or (sometimes) fused into a tube, anther apices emarginate or apiculate (the connective prolonged beyond the anther apex); ovary obovoid, summit thickened and hairy; stigmas 1-3, plumose, arising directly from the ovary summit or on a short or long hairy style. Fruit obovoid-cylindric, summit thickened and hairy.

KEY TO SPECIES, VARIETIES AND CULTIVARS OF *BAMBUSA* IN MALAYA

1a. Culms with thorny branches at the base.

2a. Culm-sheath auricles felty hairy on the inner surface, the margin with scattered bristles to 8 mm long; culm-sheath ligule a low rim 1-2 mm high with a row of dense short bristles to 4 mm long ..... 1. *B. bambos*

2b. Culm-sheath auricles coarse-bristly on the inner surface and margin, the bristles 4-25 mm long; culm-sheath ligule a rim to 8 mm high with teeth or bristles to 6 mm long on the margin ..... 2. *B. blumeana*

1b. Culms without thorny branches.

3a. Culm internodes basally inflated.

4a. Culm sheaths almost hairless on the back, the auricles only 4-5 mm high ..... 7. *B. tuldoides*

4b. Culm sheaths copiously hairy on the back, the auricles larger .... 8. *B. vulgaris* cv. *wamin*

3b. Culm internodes cylindric, not inflated.

5a. Leaves variegated, with pale stripes ..... 9. *Bambusa* sp.

5b. Leaves plain green.

6a. Culms not thicker than 3 mm ..... 6. *B. multiplex* var. *riviereorum*

6b. Culms thicker.

7a. Culms not white-waxy.

8a. Culm sheaths almost hairless on the back, the auricles only 4-5 mm high ..... 7. *B. tuldoides* (part)

8b. Culm sheaths copiously hairy on the back, the auricles larger.

9a. Culms plain green ..... 8. *B. vulgaris*

9b. Culms yellow streaked green, or completely yellow, and occasionally reverting to plain green .... 8. *B. vulgaris* cv. *vittata*

7b. Culms white-waxy.

10a. Culms to 2 cm diameter only, internodes glabrous; branches not longer than 0.5 m .... 6. *B. multiplex* var. *multiplex*

10b. Culms thicker, internodes with appressed dark hairs at the top; branches longer.

11a. Leaves densely hairy on lower side; culm-sheath auricles typically 1.5-3 cm high; filaments free, anthers yellow; stigmas 3, sessile ..... 3. *B. farinacea*, sp. nov.

11b. Leaves only scattered short-hairy, or glabrous, on the lower side; culm-sheath auricles smaller; filaments fused to form a tube, anthers maroon; stigma 1, at the end of a long style.

12a. Culms stiffly erect except for the slightly outcurved tips, basally with pale green or white streaks; culm-sheath auricles 10-15 mm high and 1-3 cm long; leaf-sheath auricles glabrous; spikelet rachilla internodes glabrous; anther tips with a spiny prolonged connective ..... 4. *B. heterostachya*

12b. Culms arched over nearly to the ground, plain green; culm-sheath auricles less than 10 mm high and 1 cm long; leaf-sheath auricles with fine bristles 2-3 mm long; spikelet rachilla internodes scattered short-hairy below the node; anther tips emarginate, with 1-several spines on one lobe or between the lobes ..... 5. *B. laxa*, sp. nov.

1. Bambusa bambos (L.) Voss in Vilmorin, Blumengartnerei 1 (1896) 1189.

Arundo bambos L., Sp. Pl. (1753) 81. Type: *Rheed*, Hort. Mal. 1 (1686) 25, pl. 16.

Bambos arundinacea Retz. (as *Bambusa*) *sensu* Gamble in Ann. R. Bot. Gard. Calc. 7 (1896) 51, pl. 48; Camus, Les Bambusees (1913) 128, pl. 74 (fig. A), pl. 75 (fig. A); Holttum in Gard. Bull. Sing. 16 (1958) 59, fig. 16 & 17; Gilliland, Revised Flora of Malaya 3 (1971) 17. Type: *Konig* s. n., India [in part: right-side specimen on the sheet] (LD); selected by Holttum in Taxon 5 (1956) 65-67.

[*Bambusa arundinacea* (Retz.) Willd., Sp. Pl. 2 (1799) 245, *pro parte: Arundo* (*Bambos*) & *B. arundinacea* in syn.]

Clumps to 25 m tall, culms slightly arching outwards. Culm 5-12 cm diameter; internodes 15-35 cm long, slightly white-waxy, glabrous, green; lower branches slender, developing spines (indurated short axillary branches) at the nodes, forming an entangled thicket-like growth. Culm sheaths green, often with yellow to orange streaks, scattered dark-brown hairy to glabrous; auricles broad wrinkled lobes continuous with the base of the blade, 10-12 mm high, inner surface densely coarse-velvety, margins sometimes with scattered bristles to 8 mm long; ligule a low rim, to 1-2 mm high, with 2-4 mm long fine bristles on the margin; blade broadly triangular to broadly lanceolate, erect becoming spreading when old, densely felty brown-hairy at the base on the inner surface. Leaf blade 4-13 cm X 6-15 mm; lower side slightly glaucous, glabrous; auricles tiny lobes with scattered pale bristles 2-5 mm long; ligule an inconspicuous ciliolate rim, less than 0.5 mm high. Pseudospikelets 10-20 mm long, consisting of 1-2 small empty bracts, 1-2 bracts

subtending prophyllate buds, no transitional (empty) glumes, 3-4 perfect flowers and 1-2 reduced flowers above these; rachilla internodes to 3 mm long between uppermost flowers, minutely hairy all over; lemma 7-10 mm long, including an apical cusp *c.* 0.5 mm long, glabrous on back, short-hairy near the apex on the inner side, with 17-19 nerves; palea as long as or slightly longer than lemma, 2-keeled, keels with short hairs *c.* 0.5 mm long, apex rounded to acute, each wing with 4 nerves, and 6 nerves between the keels; lodicules 3, the margins long-hairy, membraneous, the anterior two to 2 mm X 1.6 mm, the posterior *c.* 1.2 X 1 mm; stamens 6, anthers 4-5 mm long, tips emarginate, yellow, filaments free; ovary 1-1.5 mm long, obovoid, summit thickened and hairy; stigmas 3, plumose, sessile to subsessile. Fruit not seen.

DISTRIBUTION. In Peninsular Malaysia, it is planted only in the Botanic Garden and on the grounds of the Residency in Penang, where large clumps still exist. Holttum also mentioned a clump in the Singapore Botanic Garden, which has not been found in the course of the present study and which is, presumably, no longer existent. It is indigenous to the Indian subcontinent, Burma and Thailand, and has been introduced also to Borneo, the Philippines, Sumatra, Java, the lesser Sunda Islands, and Sulawesi in Malesia, as well as other parts of the tropics.

PENINSULAR MALAYSIA. Penang: Botanic (Waterfall) Garden, *Wong* FRI 32379 (A, K, KEP, KLU, L, SING), *Wong* s. n. 9.9.1982 (KEP); Residency Garden, *Abdul Kadir* SFN 36177 (K, KEP, L, SING), Cheang SFN 37940 (SING).

The correct application of the name *B. bambos* to this thorny bamboo has been reiterated by McClure (1946) but rejected by Holttum (1956a) on the basis that the basionym *Arundo bambos* L. is a *nomen confusum.* McClure interpreted that Linnaeus' citation of Rheede's work and the Indian name "Ily" for this bamboo, together with the mention of its commonness in India ("*Habitat in India utraque*") was indicative enough that he had this species in mind when the name *Arundo bambos* was first published. It is of secondary importance that in his second edition of Species Plantarum (page 121) in 1762, Linnaeus gave a description of the species based, apparently, on an Osbeck specimen of a different spiny species from China in his herbarium (McClure 1946); it is conceivable that Linnaeus had intended the common thorny bamboo of India and merely filed in his herbarium as this a specimen which had only superficial resemblance, given the state of documentation of bamboos then.

Retzius' *Bambusa arundinacea* was founded on a sheet with two elements mounted on it; the one on the right side has been selected to typify this name (Holttum 1956b) used for the thorny Indian bamboo, whereas the one on the left is *Bambusa vulgaris* (Holttum 1956b, McClure 1957). In spite of this, McClure (1946) had earlier demonstrated that Retzius could have included the species now known as *Bambusa vulgaris* within his concept of *Bambos arundinacea*, and that Willdenow in making the combination *Bambusa arundinacea* certainly had both *B. vulgaris* and *B. bambos* mixed in his concept (the only specimen labelled *Bambusa arundinacea* in his herbarium is in fact *B. vulgaris*). It is useful to note that *B. vulgaris* has apiculate anther tips and a long style, and *B. bambos* has emarginate anthers and sessile stigmas.

Soderstrom (1985) was of the opinion that *Bambusa bambos* (L.) Voss is the correct name for this species, and Soderstrom & Ellis (1988) have used this name in their account of Sri Lankan bamboos.

2. Bambusa blumeana J.A. & J.H. Schultes in Roemer & Schultes, Syst. Veg. 7 (1830) 1343; Munro in Trans. Linn. Soc. 26 (1868) 102; Gamble in Ann. R. Bot. Gard. Calc. 7 (1896) 50, pl. 47; Camus, Les Bambusees (1913) 130, pl. 71 (fig. C), Ridley, Fl. Malay Pen. 5 (1925) 256; Holttum in Gard. Bull. Sing. 16 (1958) 57, fig. 15; Gilliland, Revised Flora of Malaya 3 (1971) 18. Type: *Blume s. n.*, Java (L).

Bambusa spinosa sensu Bl. ex Nees in Bot. Zeit. (1825) 580; Ridley in Mat. Fl. Malay. Pen. 3 (1907) 183, *non* Roxb. ex Buch.-Ham. in Trans. Linn. Soc. 13 (1822) 480.

Clump to 30 m tall, culms slightly arched outwards. Culms 6-10 cm diameter; internodes 13-35 cm long, white-waxy, glabrous, green; lower branches slender, developing spines (short indurated axillary branches) at the nodes, forming an entangled thicket-like growth. Culm sheaths pale green to orange-pink; non-waxy; with dark brown hairs all over; auricles spreading lobes, 2-5 mm high, densely long-bristly on the inner surface and margins, the bristles dark brown and 4-25 mm long; ligule a low rim *c.* 3 mm high with pale bristles 5-6 mm long on the margin; blade broadly to narrowly lanceolate, erect at lower nodes, spreading on all sheaths at middle to upper nodes, green. Leaf blade 6-22 cm X 1.5-3 cm, glabrous; auricles tiny lobes *c.* 0.5 mm long with scattered bristles 1-2 mm long or glabrous; ligule a subentire rim c. 1 mm high, sometimes with a few bristles 1-2 mm long. Pseudospikelets 1.5-3.5 cm long, consisting of 1-2 small empty bracts, 2-3 bracts subtending prophyllate buds, 0-1 transitional (empty) glumes, 3-8 perfect flowers and 1-3 vestigial (reduced) flowers above these; rachilla internodes to 4 mm long between uppermost flowers, minutely hairy all over; lemma 6-10 mm long, including an apical cusp *c.* 0.5 mm long, glabrous, with 15-20 nerves; palea as long as lemma, 2-keeled, keels with short hairs *c.* 0.5 mm long, apex acute, each wing with 3 nerves, and 3-5 veins between the keels; lodicules 3, the margins long-hairy, membraneous, the anterior two to 1.5 X 1 mm, the posterior *c.* 1.2 X 1 mm; stamens 6, anthers 4-5 mm long, tips emarginate, yellow, filaments free; ovary *c.* 1 mm long, obovoid, summit thickened and hairy; stigmas 3, plumose; style short, *c.* 1 mm long; fruit not seen.

DISTRIBUTION. This thorny bamboo is commonly planted in villages and beside rice-fields in the northern states of Perlis, Kedah and Kelantan. Recorded Malay names include "Buloh duri" (generally) and "Buloh sikai" (at Mata Air, Perlis). Elsewhere it is only occasionally encountered, and is not common in the south. Specimen clumps are available in the Lake Gardens (formerly called Public Gardens), Kuala Lumpur and the Forest Research Institute of Malaysia at Kepong. Holttum (1958) records it as native to Java and eastern Malesia; Widjaja (pers. comm. 1988) states it is present in Java and the lesser Sunda Islands. It is also cultivated in Borneo, Thailand and the Philippines.

PENINSULAR MALAYSIA. Perlis: Ngulang, *Kamarudin & Wong* FRI 28821 (K, KEP, KLU, L). Selangor: Kepong, Forest Research Institute, planted, *Holttum, s. n.*, Sept. 1953 (K), *Kamarudin s. n.*, 11.11.1980 (KEP, KLU). Pahang: Pekan, *Ridley s. n.* 1889 (SING). **SINGAPORE**. Botanic Gardens: *Ridley* 3946 (K, SING), *s. n.* 1894 (K).

3. **Bambusa farinacea** K.M. Wong **sp. nov.** *B. tuldae* Roxb. *affinis sed margine lemmatis glabro, carinis paleae pilis brevioribus (0.2-0.3 mm) tectis, nodis rachillae annulo ciliato carentibus bene distincta. Typus: Wong & Saw FRI 34407, Malay Peninsula, Kelantan, track from Brinchang to Gua Musang (holotypus KEP; isotypi A, K, KLU, L, SAN, SAR, SING).* (Fig. 1)

[*Bambusa burmanica sensu* Holttum i n Gard. Bull. Sing. 16 (1958) 62: Holttum s. n., 26.10.1946 (SING); Gilliland, Revised Flora of Malaya 3 (1971) 19; *non* Gamble in Ann. R. Bot. Gard. Calc. 7 (1896) 35, pl. 33 (Type: *Oliver s.n.*, 16.3.1890, Burma, Katha (K!)]

Clump to 8-10 m tall, culms slightly arched outwards. Culms 3.5-7 cm diameter; internodes 20-35 cm long, white-waxy, with scattered dark brown hairs near the top, green. Culm sheaths green, sometimes flushed slightly orange, white-waxy, with dark brown hairs on the back; auricle a large lobe 10-20 mm high, sometimes corrugate, bearing pale bristles 8-20 mm long on its edge; ligule a rim to 4 mm high bearing pale bristles 2-4 mm long; blade broadly triangular, erect, green. Leaf blade 6-22 cm X 1-2.5 cm, lower side bluish green and soft pale-hairy; auricle a lobe 2-4 mm long with pale fine bristles 2-5 mm long; ligule a subentire rim 0.5-1 mm high. Pseudospikelets 20-42 mm long, consisting of 1 small empty bract, 2-3 bracts subtending prophyllate buds, 1-3 transitional (empty) glumes, 5-10 perfect flowers and 1-2 terminal vestigial flowers; rachilla internodes to 5 mm long between uppermost flowers, scantily minute-hairy to glabrescent; lemma to 15 mm long, including an apical cusp *c.* 0.5 mm long, glabrous except for short hairs on the inner side near the apex, with *c.* 18 nerves; palea slightly shorter than lemma, 2-keeled, the keels with short hairs 0.2-0.3 mm long, apex truncate to rounded, each wing with 3-4 nerves and 5-6 nerves between the keels; lodicules 3, the margins long-hairy, membraneous, the anterior two to 3 mm X 3 mm, the posterior *c.* 1.5 mm X 1.5 mm; stamens 6; anthers 5 mm long, tips emarginate, yellow, filaments free; ovary 1-2 mm long, obovoid, summit thickened and hairy; stigmas 3, plumose, sessile on the ovary summit; fruit 5-8 mm long, obovoid-cylindric, summit thickened and hairy.

DISTRIBUTION. Peninsular Malaysia (Kelantan, Kedah, Selangor). Also probable in south Thailand.

HABITAT. Open sites and forest fringes.

PENINSULAR MALAYSIA. Kelantan: track from Brinchang to Gua Musang, *Wong & Saw* FRI 34407 (holotype KEP; isotypes A, K, KLU, L, SAN, SAR, SING). Kedah: Nami area, near Kampung Pulau Belantek, *Wong* FRI 32265 (KEP); near road to Sintok, *Holttum s. n.* 26.10.1946 (SING). Selangor: road to Bukit Tinggi, *Wong* FRI 32238 (K, KEP, KLU). Pahang: Lanchang, road to Bukit Ringet at Krau Game Reserve, *Saw, Wong & Mustapa* FRI 37367 (K, KEP).

This species was identified as *B. burmanica* Gamble by Holttum (1958) based on a sterile collection he made in 1946, in the Sintok area in Kedah. Only in April 1987 was flowering material first collected, in Kelantan. This is the only truly indigenous *Bambusa* of Malaya so far known. The culm sheaths resemble those not only of *B. burmanica*, but also of the related *B. tulda* Roxb., *B. teres* Buch-Ham. ex Munro and *B. nutans* Wall. ex Munro, as

figured by Gamble (1896) and on specimens in the Calcutta, Dehra Dun and Kew herbaria. For the present study, an attempt was made, in April 1983, to compare vegetative characters of the Malayan plant with those of living specimens cultivated in the Indian Botanic Garden, Calcutta and the arboretum of the Forest Research Institute and Colleges, Dehra Dun, some of which were purportedly (Gamble 1896) raised from material from which the type specimens were taken and thus constituted "living type material". These plants all had vegetative differences from the Malayan plant (Table 1).

The only characters in which all these plants had in common were the general form of the culm sheath and the hairy lower leaf surfaces. To add to the confusion, the two clumps at the Indian Botanic Garden identified as *B. tulda* had differences from one another and from the plant identified as the same species at Dehra Dun. The late Mr. K.N. Bahadur of the Forest Research Institute at Dehra Dun, greatly familiar with Indian bamboos, had collected a flowering specimen (*Bahadur* 32, Dehra Dun, Arboretum Compartment 2, F.R.I.- DD!) from the clump at Dehra Dun he identified as *B. tulda*. The spikelets from this plant are different from those of *Wallich* 5030 (K!) and *Roxburgh s.n.*, East India (K!), both of which were cited by Munro (1868) under *B. tulda*, and of which the Roxburgh specimen is the type, in having very short (0.1-0.2 mm) hairs on the palea keels compared to those of the Kew specimens (0.5-1 mm long). On the other hand, spikelets from *Bahadur* 29, Dehra Dun, F.R.I. Arboretum Compartment 8 (DD!), taken from the bamboo at Dehra Dun which Bahadur himself identified as *B. nutans*, were the same as those from *Wallich* 5031 (K!), the type of *B. nutans*. From these, it is here suggested that the reference clumps cultivated today at Calcutta and Dehra Dun are not necessarily the same as those referred to by Gamble (1896), nor might they be the same species. There are no fertile Bahadur collections from the Dehra Dun clumps identified as *B. teres* or *B. nutans* which may be compared directly to the type specimens of these species, on which the culm sheaths and other characters are not well preserved nor described.

Under these circumstances, the final resort to determining the identity of the Malayan plant in question had to be made via comparisons of spikelet material with the type specimens of the different species that bore a superficial resemblance to it. This has since become possible with the collection of *Wong & Saw* FRI 34407, and the salient spikelet differences are summarised in Table 2 and Fig. 1. The emarginate anther apices of *B. farinacea* and *B. tulda* immediately distinguish them from *B. burmanica, B. teres* and *B. nutans*, which have apiculate anther apices. This is a reliable character, e. g., the anthers of *B. bambos*

Fig. 1. (opposite page) *Bambusa farinacea* (A-K) and the related species *B. burmanica* (L), *B. tulda* (M), *B. teres* (N), *B. nutans* (O). **A.** Top of culm sheath, dorsal view. **B.** Top of culm sheath, showing ligule on ventral side. **C.** Flowering leafy branch. **D.** Leaf base, ligule and auricle. **E.** Mature pseudospikelet with (from the base) 3 gemmiferous bracts, one transitional glume, 6 perfect flowers and a terminal vestigial flower; one rachilla internode magnified. **F.** lemma. **G.** Palea, dorsal view. **H.** Palea, ventral view. **I.** Lodicule complement. **J.** Two stamens; anther tip magnified. **K.** Fruit. **L-O** shows (left to right) dorsal view of palea with rachilla internode, one stamen, lemma apex and margin. **A-K** from *Wong & Saw* FRI 34407; **L** from *Oliver s.n.*, 16.3.1890; **M** from *Wallich* 5030C; **N** from *Wallich* 5026B; **O** from *Wallich* 5031.

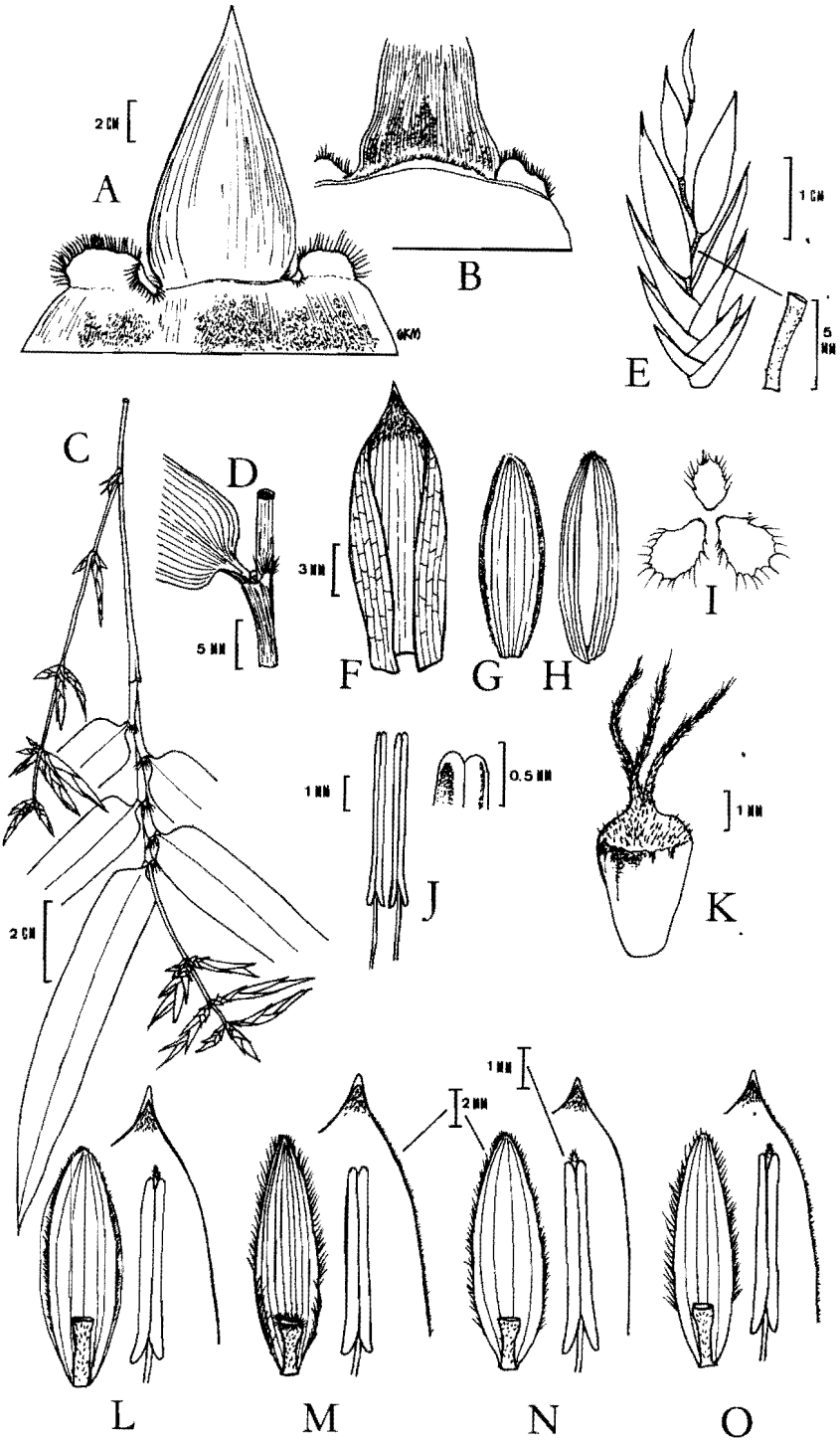
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Table 1. Differences in vegetative characters between the Malayan *Bambusa farinacea* and reference clumps of *B. burmanica, B. tulda, B. teres* and *B. nutans* at the Forest Research Institute, Dehra Dun and the Indian Botanic Garden, Calcutta.

	Culm internode waxiness	Bands of pale felty hairs around the culm nodes	Other hairs on the culm internode	White wax on fresh culm sheaths
B. farinacea	Present	Nil	Dark brown	Present
"*B. burmanica*", Dehra Dun	Nil	Present	Nil	Nil
"*B. tulda*", Dehra Dun	Present	Present	Dark brown	Present
"*B. tulda*", Calcutta	Present in clump A, nil in clump B	Present in both clumps	Dark brown in clump A, nil in clump B	Nil in clump A, present in clump B
"*B. teres*", Dehra Dun	Present	Present	Nil	Present
"*B. nutans*", Dehra Dun	Present	Nil	Nil	Nil

and *B. multiplex* are always emarginate, and those of *B. heterostachya* and *B. vulgaris* always apiculate. The fine-hairy lemma margin, long (0.5-1 mm) hairs on the palea keels and the ciliate ring at rachilla nodes of *B. tulda* distinguish it from *B. farinacea.*

Recently, *B. lixin* Hsueh & Yi has been described without flowers from Xizang in China, and this also has culm sheaths similar to those of *B. farinacea* (Yi 1983). However, in *B. lixin* the culm internodes are glabrous, the young nodes are white-tomentose and the leaf sheaths have no auricles nor oral setae, and so differ from those of *B. farinacea.* Features distinguishing *B. lixin* from other species in this group were not given by the authors. Lin (1968), in listing the bamboos of Thailand, uncritically includes "B. burmanica" and "B. tulda" as indigenous there; these two species, together with *B. farinacea*, are expected in Thailand but it is not clear from Lin's account which species are in fact present.

Table 2. A comparison of spikelet and floral characters in *Bambusa farinacea* and other species with a superficial resemblance.

	Lemma margin	Hairs on palea keels	Anther apices	Rachilla internodes
B. burmanica Type: Oliver s.n. 16.3.1890 Burma, Katha (K)	Glabrous	0.1-0.3 mm	Apiculate	Fine scattered hairs
Gamble 23765 (DD)	Glabrous	0.1 mm	Apiculate	Fine scattered hairs
B. tulda Type: Roxburgh s.n., East India (K)	Fine-hairy	0.5-1 mm	Emarginate	Short-hairy & ring of cilia at nodes
Wallich 5030 (CAL)	Fine-hairy	0.5-1 mm	Emarginate	Short-hairy & ring of cilia at nodes
B. teres Type: Wallich 5026B (K)	Glabrous	0.5 mm	Apiculate	Short scattered hairs
B. nutans Type: Wallich 5031 (K)	Fine-hairy	0.5-1 mm	Apiculate	Short scattered hairs
Bahadur 29 (DD)	Fine-hairy	0.5-1 mm	Apiculate	Short scattered hairs
B. farinacea Type: FRI 34407 (holotype KEP)	Glabrous	0.2-0.3 mm	Emarginate	Glabrous to short scattered hairs

4. **Bambusa heterostachya** (Munro) Holttum in J. Arn. Arb. 27 (1946) 341, in Gard. Bull. Sing. 16 (1958) 65; Gilliland, Revised Flora of Malaya 3 (1971) 18.

Gigantochloa heterostachya Munro in Trans. Linn. Soc. 26 (1868) 125; Gamble in Ann. R. Bot. Gard. Calc. 7 (1896) 66, pl. 57; Hook. f., Fl. Brit. Ind. 7 (1897) 400; Ridley in Mat. Fl. Malay. Pen. 3 (1907) 188; Camus, Les Bambusees (1913) 142; Ridley, Fl. Malay Pen. 5 (1925) 262. Type: *Griffith* 6731, Malay Peninsula, Malacca, Ayer Panas (holotype K).

Gigantochloa latispiculata Gamble in Ann. R. Bot. Gard. Calc. 7 (1896) 67, pl. 59; Hook. f. Fl. Brit. Ind. 7 (1897) 400; Ridley in Mat. Fl. Malay. Pen. 3 (1907) 189; Camus, Les Bambusees (1913) 143; Ridley, Fl. Malay. Pen. 5 (1925) 263. Type: *Alvins s.n.*, 16.1.1886, Malay Peninsula, Malacca, Bukit Bruang (holotype SING).

Bambusa latispiculata (Gamble) Holttum, in J. Arn. Arb. 27 (1946) 341.

Clump 6-12 m tall, culms stiffly erect except for the slightly outcurved tips. Culm 3.5-6 cm diameter; internodes 30-40 cm long, white-waxy when young, with scattered dark hairs just below the nodes, green, with pale green to white stripes at the base of the culm. Culm sheaths pale green, slightly white-waxy, with dark brown to black hairs on the back; auricles large lobes to 3 cm long and 1-1.5 cm high, with pale brown bristles 10-15 mm long on the margins; ligule a subentire rim 6-8 mm tall, with bristles *c.* 3 mm long on the margin; blade broadly triangular to broadly lanceolate, erect, pale green. Leaf blade 15-20 cm X 1.5-2.5 cm, glabrous; auricles small lobes *c.* 1 mm long, glabrous; ligule 1-3 mm high, edge ciliolate. Pseudospikelets 2.5-4 cm long, consisting of 2-3 small empty bracts, 1-2 bracts subtending prophyllate buds, 2 transitional (empty) glumes, 5-6 perfect flowers and a terminal vestigial flower; rachilla internodes to 2.5 mm long between uppermost flowers, glabrous; lemma 15-20 mm long, including an apical cusp *c.* 0.5 mm long, glabrous, with 30-36 nerves; palea slightly shorter than lemma, 2-keeled, keels with short hairs *c.* 0.5 mm long, apex rounded to acute, each wing with 3 nerves, and 7 nerves between the keels; lodicules 3, the margins long-hairy, membraneous, the anterior two to 2 mm X 1 mm, the posterior *c.* 1.5 mm X 0.8 mm; stamens 6, anthers 6-9 mm long, tips apiculate (with a spiny prolonged connective), maroon, filaments fused as a tube; ovary 1-1.5 mm long, obovoid, summit thickened and hairy; stigmas 1-3, plumose; style 4-6 mm long. Fruit 5-6 mm long, obovoid-cylindric, thickened and hairy at the summit.

DISTRIBUTION. This species, although first described from a Malayan specimen, has never been found truly wild in Malaya. On the other hand, it has not been reported from other localities except where known to have been introduced from Malaya, notably at an oil-palm plantation in the Lower Labuk and Ulu Dusun in Sabah (Dransfield 1979) as well as in Nigeria (*fide* S. Dransfield). Recorded common names in Peninsular Malaysia include "Buloh Pering," "Buloh Pengahit" and "Buloh Tilan".

PENINSULAR MALAYSIA. Perak: Changkat Jong, near Telok Anson, *Holttum* SFN 38432 (SING); Parit, *Ng* FRI 27248 (KEP), Padang Tenggala, *Wong* FRI 28976 (K, KEP, KLU, L, SING). Selangor: Bukit Cheraka Estate, *Kochummen* FRI 19458 (KEP); Kelang, Highlands Research Station, *Kochummen* FRI 19457 (KEP, L). Negri Sembilan: Kampung Air Bong, *Wong* FRI 32222 (K, KEP, KLU, L); Peradong, *Hussein* KEP 9597 (SING), KEP 9598 (K), Malacca: *Cantley's coll.* 1717 (SING); Ayer Panas, *Griffith* 6731 (holotype K), Bukit Bruang, *Alvins s.n.*, 16.1.1886 (SING). Johore: Pamolo Estate, *Galpine s.n.*, 9.12.1962 (L). **SINGAPORE**. Botanic Gardens, *Ridley* 6680 (K, SING), 8122 (SING), *s.n.* 28.9.1903 (K); Bukit Sembawang, *Sinclair s.n.*, 29.5.1949 (L); Upper Serangoon Road, *Ahmad s.n.*, 27.9.1946 (SING), *Holttum s.n.* Sept. 1946 (KEP, SING); Pulau Samulun, *Sinclair* SFN 38601 (L, SING).

5. **Bambusa laxa** K.M. Wong **sp. nov.** *B. heterostachydi (Munro) Holttum affinis, sed culmis viridibus valde arcuatis, auriculis vaginarum culmorum minoribus (ad 8 mm altis, 10 mm longis non excedentibus), auriculus vaginarum foliorum setosis, rachillae spiculae internodiis infra nodos pubescentibus, antheris apice emarginatis 1-paucas spinas uno lobo vel inter lobos ferentibus differt. Typus: Wong FRI 32382, Malay Peninsula, Perak, Masjid Tinggi (holotypus KEP; isotypi K, L).* (Fig. 2)

Clump to 5-6 m high. Culms much arched outwards, 2-4 cm diameter; internodes 20-35 cm long, slightly white-waxy when young, with scattered appressed dark brown hairs near the top, green. Culm sheaths pale green, white-waxy, with dark brown hairs on the back; auricle a lobe to 8 mm high and 5-6 mm long, bearing pale bristles 10-12 mm long on its edge; ligule a rim *c.* 2 mm high, bearing fine bristles 3-6 mm long; blade narrowly triangular to lanceolate, erect, green, abaxially with scattered appressed dark brown hairs. Leaf blade 6-15 cm X 1-1.5 cm, glabrous; auricle a tiny lobe bearing fine bristles 2-3 mm long; ligule a short rim *c.* 0.5 mm high, subentire to slightly hairy on the edge, non-bristly. Pseudospikelets to 26 mm long, consisting of 1 small empty bract, 2-3 bracts subtending prophyllate buds, 0-1 transitional (empty) glumes, 6-7 perfect flowers and 1 terminal vestigial flower; rachilla internodes 2-3 mm long between the upper perfect flowers, scattered minute-hairy just below the node; lemma to 15 mm long, without a conspicuous apical cusp, glabrous on the back (abaxial surface), short-hairy on the margins and on the inner side near the apex, with *c.* 28 nerves, palea slightly shorter than lemma, 2-keeled, the keels with long (0.4-0.8 mm) hairs at the upper part and glabrescent lower down, apex truncate to rounded, each wing with 2-3 nerves and 5-6 nerves between the keels; lodicules 3, the margins long-hairy, membraneous, the anterior two to 2 mm X 1 mm, the posterior *c.* 1.5 mm X 0.8 mm; stamens 6: anthers 5-6 mm long, tips emarginate with 1-several spines on one lobe or between the lobes, maroon, filaments fused into a membraneous tube; ovary 0.5-1.5 mm long, obovoid, summit thickened and hairy; style long, hairy, ending in a single plumose stigma.

DISTRIBUTION. Peninsular Malaysia, frequently cultivated in the Alor Setar district of Kedah and the Krian district of Perak, where it is sometimens called "Buloh tilan payong".

PENINSULAR MALAYSIA. Kedah: Alor Setar, Simpang Tiga, Batu 17, *Wong* FRI 32261 (KEP). Perak: Krian, Bagan Serai, *Wong* FRI 32415 (K, KEP, KLU, L), *s. n.* 7 Feb. 1986 (K, KEP, KLU); Masjid Tinggi, *Wong* FRI 32382 (holotype KEP; isotypes K, L).

This species is closely related to *B. heterostachya* in having similar culm sheaths, filaments fused into a tube, maroon anthers, and a long style with a solitary stigma. It is different in being overall smaller, in having culms that much arch outwards, bristly leaf-sheath auricles, spikelet rachilla internodes hairy just below the node and emarginate anther tips. Nothing like it has been found among the Indian and Thai material, or the material at Bogor, Leiden or Kew. Among Chinese bamboos, it bears superficial resemblance to McClure's *B. textilis* var. *fusca* (which is not necessarily conspecific with his *B. textilis* var. *textilis*, both of which were described without flowers). *B. textilis* var. *textilis* has pale hairs on the culm internodes (McClure 1940) and the mature spikelets have longer rachilla internodes that widely separate individual flowers and yellow anthers (see But *et al.* 1985). *B. textilis* var. *fusca* has glabrous culm internodes and is bigger and

more erect in habit, although the culm sheaths are superficially similar to those of *B. laxa*. In 1987 specimens of the species here called *B. laxa* were sent to Professor Liang-chi Chia at the South China Institute of Botany (IBSC) of the Academia Sinica in Guangzhou, who is familiar with McClure's taxa and where much of McClure's material (including the types of *B. textilis*) are preserved at the Lingnan University herbarium (now part of IBSC). He also came to the conclusion that it was undescribed, even though it was suggested that there was a possible affinity with *B. textilis* or one of its varieties which are well-known there for yielding culms good for weaving handicrafts and utensils.

In Peninsular Malaysia it is used as a source of small-diameter poles and fishing rods where it is planted.

6. Bambusa multiplex (Lour.) Raeuschel ex J.A. & J.H. Schultes in Roemer & Schultes, Syst. Veg. 7 (1830) 1350; Camus, Les Bambusees (1913) 132.

var. multiplex

Arundo multiplex Lour., Fl. Cochin. (1790) 58; Camus, Les Bambusees (1913) 132.

Ludolfia glaucescens Willd. in Ges. naturf. Freunde Berl. Mag. 2 (1808) 320.

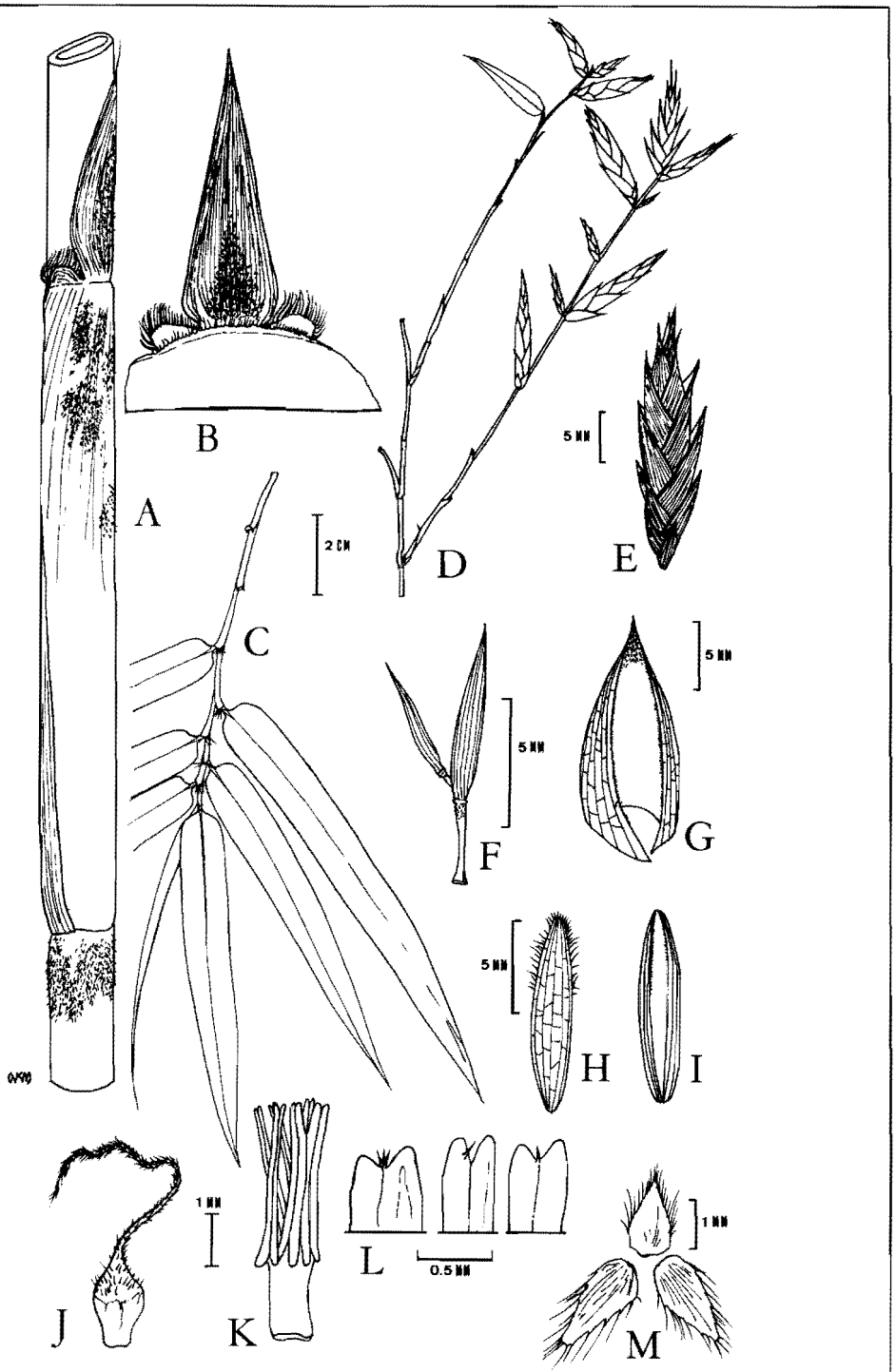
Arundinaria glaucescens (Willd.) Beauv., Essai Agrost. (1812) 144, 152; Munro in Trans. Linn. Soc. 26 (1868) 22.

Bambusa nana Roxb., Fl. Ind., ed. Carey, 2 (1832) 199; Munro in Trans. Linn. Soc. 26 (1868) 89; *sensu* Gamble in Ann. R. Bot. Gard. Calc. 7 (1896) 40, *pro parte* (excl. Wray 1560 = *Holttumochloa magica* (Ridl.) Wong), pl. 38; Ridley in Mat. Fl. Malay. Pen. 3 (1907) 184; Camus, Les Bambusees (1913) 121; Ridley, Fl. Malay Pen. 5 (1925) 258.

Bambusa glaucescens (Willd.) Sieb. ex Munro in Trans. Linn. Soc. 26 (1868) 89; Holttum in Kew Bull. no. 2 (1956) 207-211, in Gard. Bull. Sing. 16 (1958) 67, fig. 19; Gilliland, Revised Flora of Malaya 3 (1971) 20.

Clump 4-6 m tall, culms erect for about halfway and arched broadly outwards. Culm 0.5-1.5 cm diameter, internodes 20-35 cm long, slightly white-waxy, glabrous, green. Culm sheaths pale green, slightly white-waxy, glabrous; auricles none, or sometimes a tiny lobe hardly 0.5 mm high with 1-2 mm long pale bristles; ligule a subentire rim 0.5-1 mm high;

Fig. 2. (opposite page) *Bambusa laxa*. **A.** Culm sheath. **B.** Top of culm sheath, showing ligule on ventral side. **C.** Leafy branch. **D.** Flowering branches. **E.** Pseudospikelet with (from the base) an empty bract, 3 gemmiferous bracts, 7 perfect flowers and a partially hidden terminal vestigial flower. **F.** Uppermost perfect flower and terminal vestigial flower with their rachilla internodes. **G.** Lemma. **H.** Palea, dorsal view. **I.** Palea, ventral view. **J.** Pistil. **K.** Filament tube and anthers. **L.** Detail of anther apices. **M.** Lodicule complement. All from *Wong* FRI 32382.


A
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blade broadly to narrowly triangular, erect, pale green. Leaf blade 2.5-12 cm X 0.3-1.5 cm; lower side glaucous, glabrous to scattered short-hairy; auricles tiny lobes, 0.5-2 mm tall with fine bristles 2-3 mm long; ligule an inconspicuous subentire rim less than 0.5 mm high. Pseudospikelet 2.5-4 cm long, consisting of 2-3 small empty bracts, 2 bracts subtending prophyllate buds, no transitional (empty) glumes, 6-9 perfect flowers and a terminal vestigial flower; rachilla internodes to 5 mm long between uppermost flowers, glabrous; lemma 10-16 mm long, glabrous, with 18-22 nerves; palea slightly shorter than lemma, 2-keeled, keels with short hairs 0.1-0.2 mm long only near the apex, apex rounded to truncate, each wing with 4 nerves, and 6 nerves between the keels; lodicules 3, the margins glabrous or minutely ciliolate, membraneous, the anterior two to 2.2 mm X 0.8 mm, the posterior *c.* 2 mm X 0.5 mm; stamens 6, anthers 4-6 mm long, tips emarginate, yellow, filaments free; ovary 1-1.5 mm long, obovoid, summit thickened and hairy; stigmas 3, plumose, sessile to subsessile. Fruits not seen.

DISTRIBUTION. Holttum (1958) suggested that the species is native to China and Japan. It is commonly found used as hedges or planted as individual clumps throughout southeast Asia and India, and has been introduced to other parts of the tropics. Willdenow's name *Ludolfia glaucescens* was given to a plant which flowered at Berlin, where it was cultivated, in 1808. In Malaysia it is called "Buloh Cina" or "Buloh pagar".

PENINSULAR MALAYSIA. Penang: *Curtis* 1720 (K, SING); between Ayer Itam & Penara Bukit, *Burkill* SFN 1465 (K, SING); Government Hill, *Nauen* SFN 38097 (K, SING), *Ridley s.n.*, Feb. 1892 (SING); Penang Hill, *Wong* FRI 32386 (KEP, KLU), FRI 32387 (KEP, KLU); Western Hill, *Wong* FRI 32431 (KEP, KLU). Perak: Taiping, *Mahmood* KEP 9989 (KEP, SING). Negri Sembilan: Seremban, *Alvins* 1983 (SING). **SINGAPORE.** Bukit Timah: stream near quarry, *Sinclair s. n.*, 28.5.1949 (L).

Soderstrom & Ellis (1988) have argued that Loureiro's name *Arundo multiplex* should be used as the basis of the name for this commonly cultivated small bamboo; earlier, Holttum (1956c) had dismissed Loureiro's description (Loureiro 1790) as being inadequate for identifying this species. Loureiro's description for his *Arundo multiplex* refers to a bamboo commonly known as "cay hop," which is unarmed and has three sessile stigmas, and is commonly planted as hedges. Only two other species in the region have common names using the word "hop," one being *B. flexuosa* Munro (which is thorny), the other *B. tuldoides* Munro (which is used for hedges but has a distinct style), and both of these were not what Loureiro had intended. There seems no doubt that Loureiro's *Arundo multiplex* was intended for this species.

var. riviereorum R. Maire, Flore Afrique Nord 1 (1952) 355.

B. glaucescens var. *riviereorum* (R. Maire) L.C. Chia & H.L. Fung in Phytologia 52 (1982) 257.

In recent years, a horticultural variant with tiny culms (not thicker than 3 mm) and smaller leaves on short branches, altogether perhaps 30 cm high, popularly called the Chinese Goddess Bamboo (a dwarf form of *B. multiplex* var. *riviereorum* R. Maire), has been occasionally cultivated as a pot plant.

7. **B. tuldoides** Munro in Trans. Linn. Soc. 26 (1868) 93; Camus, Les Bambusees (1913) 117. Type: China, Canton, Millett, s. n. (holotype K).

B. ventricosa McClure in Lingnan Sci. J. 17 (1938) 57; Holttum in Gard. Bull. Sing. 16 (1958) 70; Gilliland, Revised Flora of Malaya 3 (1971) 21. Type: *McClure* 20667, China, Lingnan Univ. Bamboo Garden accession no. 2651 (herbarium, Lingnan Natural History Survey & Museum).

Clump to 4 m tall but usually (in pot-grown specimens) 0.5-1.5 m high, culms slightly arched outwards. Culm 0.5-3.5 cm diameter (in potted specimens 0.5-2 cm); internodes cylindrical but sometimes (in potted specimens, usually) basally inflated, 5-15 cm long (3-6 cm in potted specimens), non-waxy, glabrous, green. Culm sheaths pale green to pinkish green, non-waxy, glabrous; auricles small rounded lobes 1-5 mm high, with scattered short pale bristles 2-3 mm long; ligule a subentire rim 1-4 mm high; blade broadly elliptic to narrowly triangular, erect, pale green. Leaf blade 6-15 cm X 0.8-2 cm, glabrous to short pale-hairy on lower surface; auricles small lobes *c.* 1 mm long with fine bristles 2-3 mm long; ligule a subentire rim *c.* 0.5 mm high. Pseudospikelets 2.5-4.5 cm long, consisting of 1-2 small empty bracts, 1-2 bracts subtending prophyllate buds, 1 transitional (empty) glume, 2-5 perfect flowers and 1-2 reduced flowers above these; rachilla internodes to 4 mm long between uppermost flowers, minutely hairy below nodes; lemma 10-14 mm long, including an apical cusp *c.* 0.5 mm long, glabrous on back, short-hairy near the apex on the inner side, with 12-14 nerves; palea slightly shorter than lemma, 2-keeled, keels with short hairs *c.* 0.5 mm long, apex rounded to acute, each wing with 1 nerve, and 3 nerves between the keels; lodicules 3, the margins long-hairy, membraneous, the anterior two to 1.5 X 0.5 mm, the posterior *c.* 1 X 0.5 mm; stamens 6, anthers 4-5 mm long, tips apiculate, maroon, filaments free; ovary 1-1.5 mm long, obovoid, summit thickened and hairy; stigmas 3, plumose; style 4-6 mm long. Fruit not seen.

DISTRIBUTION. South China. This species is commonly planted as an ornamental and a curiosity in South China and southeast Asia, and has been introduced to Europe, the United States and Puerto Rico. It has not been known to flower in Peninsular Malaysia.

PENINSULAR MALAYSIA. Negri Sembilan: Port Dickson, Merlin Hotel, pot-grown, *Wong* FRI 32193 (KEP, KLU). **SINGAPORE.** Cultivated in Botanic Garden, *Ridley* 451 (K).

Young, Haun & McClure (1961) note that this species (recorded as *B. ventricosa*) grew to 55 feet (*c.* 18 m) high in Puerto Rico and Florida while planted in the ground, and that the distortion of the internodes tended to disappear. As Holttum (1958) noted, the swollen internodes characteristic of pot-grown plants are by no means an irreversible condition for the clump; plants grown in open ground develop culms with more cylindric internodes. This is one of two taxa commonly referred to as the Buddha's Belly Bamboo, which alludes to the resemblance of the distended internodes to the rounded abdomen in popular images of a laughing Buddha; the other is *B. vulgaris* cv. *wamin* McClure. *B. ventricosa* was described by McClure without flowering material, and in 1932 material derived from the plant McClure purchased from a Canton nursery (the basis of his species) was sent to the Tropical Agricultural Research Station in Mayaguez, Puerto Rico, where it was planted. Recently, flowering collections from this plant were made by

Edelman and determined by Soderstrom as identical with *B. tuldoides* (Edelman, Soderstrom & Deitzer 1985). But *et al.* (1985) provided colour photographs for *B. ventricosa* including one clearly showing yellow anthers. They also describe thorny lower branches for the larger, ground-planted form; this is not mentioned in descriptions by McClure (1938), Holttum (1958), and Young, Haun & McClure (1961) and does not occur in ground-planted specimens in the Singapore Botanic Garden. It is possible the photograph showing yellow anthers came from a thorny bamboo described by them under *B. ventricosa*; anthers in *B. tuldoides* (the correct and earlier name for *B. ventricosa*) are maroon.

B. tuldoides cv. *swolleninternode* Xia, published recently (Xia 1985) based on a sterile specimen from Guangdong, China (*Xia* B 0064 at IBSC) is very similar and might be the same.

8. Bambusa vulgaris Schrad. ex Wendl., Collect. Pl. 2 (1810) 26, pl. 47; Munro in Trans. Linn. Soc. 26 (1868) 106; Gamble in Ann. R. Bot. Gard. Calc. 7 (1896) 43, pl. 40; Ridley in Mat. Fl. Malay. Pen. 3 (1907) 185; Camus, Les Bambusees (1913) 122, pl. 76 (fig. A); Ridley, Fl. Malay. Pen. 5 (1925) 256; McClure in Blumea Suppl. 3 (1946) 108; Holttum in Gard. Bull. Sing. 16 (1958) 63, fig. 18; Gilliland, Revised Flora of Malaya 3 (1971) 19.

[*Bambos arundinacea* Retz., Obs. Bot. 5 (1788) 24, *pro parte*: specimen on left side of sheet "India, *Konig*" (LD)].

[*Bambusa arundinacea* (Retz.) Willd., Sp. Pl. 2 (1799) 245, *pro parte*: specimen "*B. arundinacea* 1" (B-W)].

Clump to 12-20 m tall (or only up to *c.* 3 m tall in cv. *wamin*), culms broadly arched outwards (or only slightly outarched in cv. *wamin*). Culm 4-10 cm diameter (or only 1-3 cm in cv. *wamin*); internodes 20-40 cm long (or only 4-10 cm long in cv. *wamin*), cylindrical, but basally inflated in cv. *wamin*, without white-waxy deposits but often quite glossy, glabrous or (rarely) with scattered dark hairs below the nodes, green in the typical form and cv. *wamin*, yellow streaked green to wholly yellow in cv. *vittata*. Culm sheaths green, non-waxy, with dark brown to black hairs on the back; auricles raised, somewhat curved lobes 0.5-2 cm high, with pale brown bristles 3-8 mm long; ligule a rim 3-4 mm high, with scattered pale bristles 1-3 mm long on the edge; blade broadly triangular to broadly lanceolate, erect but sometimes (on old sheaths) spreading, green. Leaf blade 6-30 cm X 1-4 cm, lower side glabrous; auricles small rounded lobes 0.5-1.5 mm high, glabrous or with a few bristles 1-3 mm long; ligule a subentire rim 0.5-1.5 mm high. Pseudospikelets 12-15 mm long, consisting of 2-3 small empty bracts, 2-3 bracts subtending prophyllate buds, 1-2 transitional (empty) glumes, 5-10 perfect flowers, and a terminal vestigial flower; rachilla internodes to 3 mm long between uppermost flowers, densely short-hairy at the upper part; lemma 8-10 mm long including an apical cusp *c.* 0.5 mm long, back glabrous, margins with fine hairs hardly 0.1 mm long near the apex, inside short-hairy at the apex, with 10-16 nerves; palea slightly shorter to slightly longer than lemma, 2-keeled, keels with short hairs 0.5-0.8 mm long, apex rounded to acute, each

wing with 1 nerve, and 3 nerves between the keels; lodicules 3, the margins long-hairy, membraneous, the anterior two to 1.5-2.5 X 0.4-1 mm, the posterior *c.* 1-1.5 X 0.3-0.8 mm; stamens 6, anthers 6-7 mm long, tips apiculate (with a spiny prolonged connective), maroon, filaments typically free but sometimes fused as a tube; ovary 1-1.5 mm long, obovoid, summit thickened and hairy; stigmas 3, plumose; style 3-7 mm long. Fruit not seen.

DISTRIBUTION. Found throughout the tropics and subtropics, *B. vulgaris* is probably the most commonly encountered cultivated bamboo in southeast Asia, found everywhere in villages, on river banks and in towns planted as ornamentals. It is believed to have originated in tropical Asia, but in Malaya has never been found in remote wild places. Typical green *B. vulgaris* has been called "Buloh Aur" (although both Malay words mean bamboo), "Buloh Pau", "Buloh Minyak" and "Aur Beting" in Malay.

PENINSULAR MALAYSIA. Perak: Blanja, Wray 141 (K, SING); Grik, *Hamid* KEP 6421 (KEP, SING), KEP 8255 (K, SING); Parit, *Ng* FRI 27247 (KEP). Selangor: Kepong, Forest Research Institute, *Wong* FRI 28936 (KEP). **SINGAPORE.** Botanic Gardens, *Ridley* 6115 (K, SING), 6545 (K, SING), 6679 (K, SING), 8079 (K, SING), 8899 (K, SING); Colonial Secretary's Garden, *Ridley* 5599 (K, SING).

Retzius' concept of *Bambos arundinacea*, and Willdenow's concept when he made the combination *Bambusa arundinacea* had elements of *Bambusa vulgaris* and *Bambusa bambos* in them (see under *Bambusa bambos* here). Occasionally the filaments of a flower can be fused into a tube, as also noted by Soderstrom & Ellis (1988).

cv. vittata McClure in Fl. Guatemala in Fieldiana Bot. 24 (2) (1955) 60.

B. striata Lodd. ex Lindl., Penny Cyclop. 3 (1835) 357; Hook. f. in Curtis Bot. Mag. 30 (1874), pl. 6079.

B. vulgaris [var.] *vittata* A. Riviere in A. & C. Riviere, Bull. Soc. Acclim. ser. III, 3 (1878) 640.

B. vulgaris var. *striata* (Lodd. ex Lindl.) Gamble in Ann. R. Bot. Gard. Calc. 7 (1896) 44; Holttum in Gard. Bull. Sing. 16 (1958) 63; Gilliland, Revised Flora of Malaya 3 (1971) 20.

This cultivar is indistinguishable from the typical state of the species, which has green culms, except that here the culms are yellow streaked green, or occasionally plain yellow. Reversion to the wholly green state is possible, and probably this is no more than a colour variant which has been selectively propagated. Variegation in monocots is quite well known and during the present study two forms of *Gigantochloa scortechinii* Gamble in the wild have been noted, one with white-striped leaves and the other with wholly orange-yellow culms instead of the typical form with plain green leaves and culms. Plants were established from rhizome offsets of these two forms at the nursery of the Forest Research Institute in Kepong, whereupon only the yellow-culmed form retained its colour difference. No doubt if this were selectively propagated we should also have a cultivar on hand. For

these reasons it is logical that McClure designated the correct rank for plants of *B. vulgaris* with culms yellow streaked green; they are certainly not a clear-cut natural subgrouping of the species.

DISTRIBUTION. Popular as an ornamental throughout the tropics and subtropics. This is commonly called "Buloh Gading", "Aur Gading" or "Buloh Kuning" in Malay.

PENINSULAR MALAYSIA. Perak: Grik, *Hamid* KEP 6426 (KEP, SING), 6428 (SING). Selangor: Petaling Jaya, Taman Jaya, *Wong & Mustapa* FRI 28985 (A, K, KEP, L, SAN, SAR, SING).

cv. wamin McClure, The Bamboos (1966) 162.

B. vulgaris f. *waminii* T.H. Wen in J. Bamboo Res. 4 (2) (1985) 16.

Another popularly cultivated "Buddha's Belly Bamboo," this grows to only about three meters tall and has internodes which are basally inflated. It was originally listed under the Burmese vernacular name "Wamin" by Brandis (1906, p. 685).

DISTRIBUTION. Commonly planted as an ornamental in the South-east Asian and New World tropics and subtropics.

9. Bambusa sp.

Holttum in Gard. Bull. Sing. 16 (1958) 71.

Clumps to *c.* 2.5-3 m high. Culms erect, arching out very slightly; internodes green, without white wax, appressed dark-hairy at the top, *c.* 1-1.5 cm diameter. Culm sheaths black-hairy on the back, auricles small lobes *c.* 2-3 mm high, with bristles 2-3 mm long on the edge; ligule a low rim 2 mm high, subentire to minutely hairy on the edge; blade triangular, erect. Leaf blades 5-14 cm X 1-1.5 cm, glabrous on both sides, green with white longitudinal stripes.

SINGAPORE. Botanic Gardens, Lawn J, *Holttum* SFN 41025 (K, L, US).

This is evidently another common cultivar, but we do not know of which species or if it has a name. The dark-hairy upper part of internodes and more pronounced culm-sheath auricles distinguish it from *B. multiplex*. It has not been collected in flower, and it has not been possible to name it in the herbaria of southeast Asia, Kew or Leiden. It is evidently not of Indian or Malesian origin, and Holttum (1958) speculated a Chinese origin for it. Prof. Wenyue Hsiung of the Nanjing Forestry University was shown some live plants in 1987 and did not recognise it as a Chinese bamboo. There seems to be nothing resembling it among bamboos with variegated leaves from China, Hong Kong or Japan (see also But *et al.* 1985, Okamura & Tanaka 1986). In Peninsular Malaysia and Singapore it is referred to as "Bambusa variegata" in horticultural circles.

Excluded Species

Bambusa klossii Ridl., Fl. Malay Pen. 5 (1925) 259. Type: Malay Peninsula, Kedah, Kedah Peak, *Robinson & Kloss* 6069 (K) = *Dendrocalamus hirtellus* Ridley. Holttum (1958) included *Robinson & Kloss* 6109 under *B. klossii*, this is here reidentified as *Maclurochloa montana* (Ridl.) Wong - see Wong (1993).

Bambusa magica Ridl. = *Holttumochloa magica* (Ridl.) Wong; see Wong (1993).

Bambusa montana (Ridl.) Holtt. (based on *Dinochloa montana* Ridl.) = *Maclurochloa montana* (Ridl.) Wong; see Wong (1993).

Bambusa pauciflora Ridl. = *Maclurochloa montana* (Ridl.) Wong.

Bambusa ridleyi Gamble = *Soejatmia ridleyi* (Gamble) Wong; see Wong (1993).

Bambusa wrayi Stapf = *Kinabaluchloa wrayi* (Stapf) Wong; see Wong (1993).

Summary of taxonomic changes

An enumeration of taxonomic changes to the concept of *Bambusa* embodied in the revision of Holttum (1958) is provided in Table 3.

Table 3. A summary of taxonomic changes to the concept of *Bambusa* in Holttum (1958). For authorities, see Systematic Enumeration.

Species enumerated under *Bambusa* by Holttum (1958)	Status of names used by Holttum (1958)	Accepted identities
Bambusa arundinacea	synonym	*Bambusa bambos*
B. blumeana	no change	*B. blumeana*
B. burmanica	incorrectly applied	new species: *B. farinacea*
B. heterostachya	no change	*B. heterostachya*
B. glaucescens	synonym	*B. multiplex*
B. ventricosa	synonym	B. tuldoides

(continued next page)

(Table 3 continued)

B. vulgaris	no change	*B. vulgaris*
B. sp. indet	insufficient material for identification	*B.* sp. indet.
-	-	new species: *B. laxa*
B. klossii (a) *B. klossii Ridl.*	synonym	*Dendrocalamus hirtellus*
(b) *B. klossii sensu* Holttum, *pro parte*: Robinson & Kloss 6109	synonym	*Maclurochloa montana*
B. montana	basionym of type of distinct genus *Maclurochloa*	*Maclurochloa montana*
B. pauciflora	synonym	*Maclurochloa montana*
B. magica	basionym of type of distinct genus *Holttumochloa*	*Holttumochloa magica*
B. ridleyi	basionym of type of distinct genus *Soejatmia*	*Soejatmia ridleyi*
B. wrayi	basionym of type of distinct genus *Kinabaluchloa*	*Kinabaluchloa wrayi*

With the present understanding, the following conclusions can be made:

(1) *Bambusa* in Malaya is represented by nine species as follows:
one undisputedly native species, *B. farinacea*;
two species that can be found only in cultivation and first described from Malaya (*B. heterostachya* and *B. laxa*);
five species known only in cultivation and first described from elsewhere than Malaya; and
one species known only in cultivation and as yet unidentifiable for lack of good material.

(2) other species placed or maintained in *Bambusa* by Holttum (1958), not without hesitation, have been shown to belong to four distinct genera (Wong 1993). Three of these genera (*Holttumochloa, Maclurochloa* and *Soejatmia*) appear from present inventory to be endemic to Malaya while the fourth (*Kinabaluchloa*) is represented by one Malayan species and one Bornean species.

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